developement of the mental powers; in short, that man is not to be treated as a mere machine for money making. This is all very reasonable and very true.

The most impassioned of Lamartine's speeches, is that on the abolition of slavery in the French colonies.

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8. — *On the Employment of the Electro-Magnet as a Moving Power; with a Description of a Model Machine worked by this Agent.* By W. B. O'Shaughnessy, M. D., Professor of Chemistry, &c. in the Medical College of Calcutta. Calcutta. 1837. 8vo. pp. 19.

It would have been natural to expect from Calcutta a case of indigo or of gum shellac, rather than a pamphlet upon a matter of science. The love of science, however, implanted in Europe, goes with the adventurer to Asia or Van Diemen's Land. Learning is, and will continue to be cultivated wherever commerce fixes the abode of the European race; and we may confidently anticipate for our successors, in the next generation, great anxiety for the arrival of the Transactions of the Royal Society of Port Jackson, or the Memoirs of the Institute of Mauritius.

No particular connexion appears to have been observed between electricity and magnetism, before the year 1819. Three years before that time, indeed, Biot, in describing the mechanical methods of developing magnetism, observes, that an electrical discharge produces magnetism, in iron, by the *blow-choc*, with which its influence is communicated. In the year 1819, however, Professor Oersted of Copenhagen observed, that the connecting wire of a voltaic circle had the power of deflecting the magnetic needle from its usual direction. From this observation, the successive labors of Oersted, Ampère, Biot, Arago, Davy, Faraday, and Barlow have produced a new science, known under the name of electro-magnetism. The first continued motion, in a rotary form, by electro-magnetism, was produced by Mr. Faraday; and to Mr. Barlow we owe the first treatise giving, in a mathematical form, a rational theory of its action. All this was accomplished within three or four years after the first observation of the existence of the electro-magnetic force; and it is not to be supposed that it escaped the sagacity of those who were investigating its laws and extending its action, to inquire whether it would be possible to derive from it a mechanical power which could be employed to any purpose in the arts. The inquiry, however, was at once met by the insignificance of the force

developed, which was not extended beyond driving imitation cork fishes through the water, or spinning a few strange-fashioned whirligigs. Moreover, to produce feeble motions of this kind for a short period, an expensive apparatus was required, which was rapidly destroyed by the chemical action necessary to its excitement. This appeared, obviously, fatal to any project for turning electro-magnetism to account, in the arts. But as observations have been multiplied, and apparatus enlarged and improved, a number of new experimenters have appeared, who have fallen into the hope that the new science holds matter to carry on the business of the world with; and the course of these enthusiasts is abundantly supported by the wonder-loving multitude, whose indiscriminate praise of every pretended discovery has given more pain to the truly ingenious and skilful cultivators of science and the arts, than all the neglect which they have been called upon to endure.

This class of experimenters seem to have placed their principal reliance, for success, upon the discovery of the prodigious energy of attraction which may be given to a bar of soft iron, by surrounding it with a coil of wire in connexion with the voltaic circle; and magnets have been formed in this way, capable of sustaining more than a ton weight. It has seemed to them, that an attraction, of this magnitude, might be made to move mill work and ships, and thus supplant wind, waterfalls, and steam. But it is necessary to bear in mind, in this investigation, that an impelling force, or motive power, cannot be formed from an attraction only, however intense, limited to a mere point. To form a motive power, the attraction must be exercised through a sensible space; and the power is greater, in its effect, in exact proportion as the space of its action is extended. Thus cohesive attraction, though unlimited, practically, in magnitude, seems wholly incapable of producing a motive power, useful in mechanics, from the limited sphere of its action; while the weight of bodies, acting without sensible diminution through a great range, near the earth's surface, is constantly applied to produce motion in machines. Now, magnetic attraction approaches, in the limit of its action, to the attraction of cohesion. Thus an electro-magnet, which will sustain hundreds of pounds when in contact with its poles, will not raise an ounce at the distance of half an inch; its attraction decreasing in the ratio of the square of the distance, or not varying essentially from this law.

Although most of the persons, engaged in attempts to produce a new motive power from electro-magnetism, are probably aware of the fact here stated, they do not appear to have attached to it,

in their investigations, the importance it deserves; and this error in their estimate is perhaps to be attributed, in a degree, to the faulty language commonly employed to express the energy of magnetic attraction. Thus it is said that a magnet will raise a certain weight, when it has merely the power to suspend or sustain such weight when brought into contact with it; and can no more raise it, that is, give it motion upwards, through any assignable space, than the column can raise the edifice which it supports. Dr. O'Shaughnessy states very clearly the fact of the confined range of magnetic attraction, here recited, but he seems to regard it rather as presenting an obstacle to bringing the electro-magnetic force into continued action, than as seriously diminishing the amount of its force when made to act. Thus he says,

"It is impossible to avoid the impression, that by appropriate mechanical contrivances, this enormous and easily generated power could be made available as a mechanical force. But the difficulties which beset the attempt are many and important. In the first place, though the sustaining power of the electro-magnet be immense, the force operates through such a small distance, that the magnet which would hold up *one hundred pounds*, would not *lift one pound* at the distance of two inches; nay, of one inch." — p. 2.

Again;

"On commencing my experiments in July last, my principal object was, if possible, to apply the force *directly* to the moving of a wheel. Could this be accomplished, it seemed to me that we would use the whole of the magnetic force, unopposed by terrestrial gravitation; that we would act at the greatest possible mechanical or lever advantage; and that should one wheel succeed, a series might be so arranged together, that the maximum of several forces might be made to coöperate, so as to render a number of the small spaced magnetic powers (say 12 powers at half an inch), equivalent to *one* power acting uniformly through the whole space, say six inches." — p. 3.

Amidst the confusion and reaching to "mechanical or lever advantage" for aid, in the last paragraph, we perceive that the author rather feared that he should not produce a force acting equably, than that it would not act sufficiently.

Granting him, however, and we do this very fully and freely, all the merit of overcoming what appears to him a principal difficulty, by very ingenious contrivances; let us see what amount of power he produced. After the description of his principal machine, which would be out of place in a notice like this, he says,

"A cord was attached to the axle, made to play over a pulley half an inch in diameter, and connected with a scale. On starting the

model, the axle lifted ten troy ounces while the wheel was revolving forty times, and a troy pound while revolving about thirty times per minute." — p. 9.

The size of the axle is given at page 6, at half an inch in diameter. Allowing for the size of the cord, we may take the pound weight to have been raised two inches at each revolution, or sixty inches, five feet, in a minute. The machine then moved with 1-6600th of a horse power! and yet the author is not without hope, that it may be applied to produce locomotion on railways. He says, p. 11,

"The application of this power to locomotive engines on railroads is the first which I anticipate. The recent treatise on locomotive machines, by the Chevalier de Pambour, makes me speak with some confidence on this point. His admirable investigations on the theory and working force of the carriages on the Manchester and Darlington railways, show that the power necessary for the pulling of one ton at the average is actually only 7½ lbs.; that is, that a weight of seven pounds, suspended over a pulley by a chord attached to the carriage, will draw the ton weight on a level railway. My first model is by experiment proved to possess one-seventh of this power; or, in other words, to have attractive force sufficient to move more than 300 lbs." — p. 11.

It was capable of drawing three hundred pounds; but how fast? Why, as we have seen above, five feet in a minute, or a mile in seventeen hours. Will this do in this railroad age? Commend us to the ox or the ass for our light dragoons, rather than to such locomotives. The "swag-bellied Hollander," floating in his *treckschuyt*, cries shame upon it.

In a short appendix to the pamphlet of Dr. O'Shaughnessy, we have accounts of attempts to produce motive power from electro-magnetism, as they have been made in London, Paris, Brussels, Turin, Albany, and Dublin. Of these several attempts, none appears to surpass that of our countryman, Mr. Davenport, who is yet, we believe, continuing his experiments at New York.

It will be perceived, by the preceding remarks, that we have no high expectations of success from any efforts which have been, or will be, undertaken to move machines by electro-magnetism *in the present state of the developement of its powers.* At the same time, the curious phenomena presented by this new science are deserving of all study and attention. In our opinion, we are not to expect any thing useful by mere changes in the combinations of the apparatus in which the motion is produced, but rather from persevering attempts to bring out, by cheap and simple means, greater quantities of the influence, or fluid, whatever it may be, by which motion is excited. Whether such efforts, so directed, can ever be successful, we make no

prediction. We are ready to declare, however, that waterfalls and steam seem to us to possess a vantage ground, not likely to be attained by any of the other powers to which it has been supposed that these must give place.

Many countries are traversed by rivers, whose falls furnish mill powers sufficient for all their manufacturing purposes, as now conducted. Our own country, especially in its northern and eastern parts, is abundantly supplied with these without laying the hand upon Niagara. But when, from an increase of population, that shall be required to drive the spindle and the loom, — and to such uses it must come, however loud the remonstrances of lovers of the picturesque, — it will be found, computing from a common estimate of its quantity of water, equal to the constant labor of some four or five millions of horses; a power greater than all the zinc, copper, and sulphur mines in the world, turned into charged galvanic batteries, and applied to excite electro-magnetism, will produce. And this power can be obtained merely by digging a few canals, and building a few water-wheels.

Again, in countries not possessed of waterfalls, or for purposes to which these cannot be applied, the steam-engine, strong in limb and of enduring substance, is at hand, yielding from the combustion of a bit of coal no larger than an English walnut, a power sufficient to raise a man from the pavement to the cross of St. Paul's.* Is electro-magnetism likely to furnish an equal power from equal means? For us we can see no chance for its success. It is not in the cards.

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9. — *Giornale di Statistica compilato dagl' Impiegati nella Direzione Centrale della Statistica di Sicilia. Primo Quatrimestre.* Palermo. Presso la Reale Stamperia. 1836. 8vo. pp. 152.

This is the first number of a quarterly Statistical Journal, published in Sicily. The first article is an essay on the theory of statistics, showing the meaning of the term, and the character and limits of the science. The second is an article translated from the Edinburgh Review, on British statistics; and this is followed by short notices of several works on the statistics of

* With the best constructed Cornish engines, a bushel, 2150 cubic inches, of coal, will form steam to raise 94 millions of pounds, one foot high. Consequently one inch raises 43,720 pounds, one foot high; or 126 pounds, three hundred and fifty feet high.